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FCC OET Meeting
October 26th, 2005

QUALCOMM Incorporated is a leading developer and supplier of digital wireless communications products and services and is the innovator of CDMA, a technology that has become the world standard for the wireless communications industry.

Agenda

- **Review QUALCOMM proposal to the FCC NPRM 03-137**
  - Specifically review the latest QUALCOMM filing made August 16th 2005
- **Lenovo Presentation**
  - Lenovo Presentation to the FCC on the impact of SAR testing for Wireless Wide Area Network adapters
- **QUALCOMM interim proposal for minimizing SAR tests on embedded WWAN Notebook products to ensure that these products get to market quickly while the public's safety and health are fully protected**

QUALCOMM Original Comments Filed in FCC NPRM 03-137- Dated December 8, 2003

- Given the rapid proliferation of 3G CDMA technologies, laptop and PDA manufacturers wish to offer an integrated solution with 1xRTT and/or 1xEV-DO modules
- These enhanced laptops and PDAs will make it significantly easier for consumers to use 3G services
- To ease the use of 3G services for the American public and improve time to market, the FCC should adopt rules to streamline the approval process for such Part 22 and 24 modular transmitters, just as the NPRM proposes streamlining for Part 15 modular transmitters
- New products, such as 3G-readylaptops, can get to market more rapidly if the SAR testing requirements are clear

Overview of QUALCOMM Proposals to FCC NPRM 03-137

- QUALCOMM filed Comments for FCC NPRM 03-137 in support of WWAN approvals
  - Formalize FCC Part 22/24 module approval process
    - Currently FCC informally uses WLAN module definitions per DA 00-1407
  - Streamline FCC Test Requirements
    - Remove SAR requirement for devices <500mW that maintain a specified separation distance of 20cm
  - Allow Class I/II permissive changes for portable devices integrated into similar laptop families where grant notes can be maintained
- Additional Recommendations made to the FCC during May 2004 meeting with OET and through additional filing made August 16th 2005.
  - Recommended minimum separation distance of 10cm as a distance at which valid MPE measurements can be made at the frequencies used by WWAN licensed devices
  - QCOMM also proposes that the FCC allow the installation by customers and retailers of Part 22 and 24 approved modules into laptops
    - Just as the FCC today permits unlicensed modules to be installed by end-users into laptops.
    - This would permit laptop vendors to sell WWAN-ready laptop, with the WWAN antennas and other necessary components built in, but in which the end-user could install an approved module and enable WWAN connectivity for their laptop device.

3G Market & Embedded Update

Three trends should be considered early indicators of the future success of broadband access via 3G wireless networks

1. **The first trend is the ongoing shift from desktop computers to notebook computers**

   A recent report by the Gartner[1] estimates that global notebook shipments currently represent over 30% of all personal computers shipped today and will account for 40% of all personal computers shipped by 2009

2. **Second is the growing demand for wireless broadband currently represented by WLAN**

   WLAN connectivity was initially achieved through PC cards. Today, most WLAN modems are embedded directly into notebooks as a standard configuration. Strategy Analytics[2] estimates that approximately 70% of notebooks sold today have an embedded WLAN modem.

3. **Third is the continuing proliferation of 3G networks around the world**

   There are over 159 commercial 3G networks which are providing service to over 203 million paying subscribers[3]

[1] Source: Gartner Dataquest Marketview Database - June 2005

[2] Strategy Analytics, Dec. 2004 Global Notebook PC Sales Forecast

[3] Source: 3G today, http://www.3gtoday.com October 2005

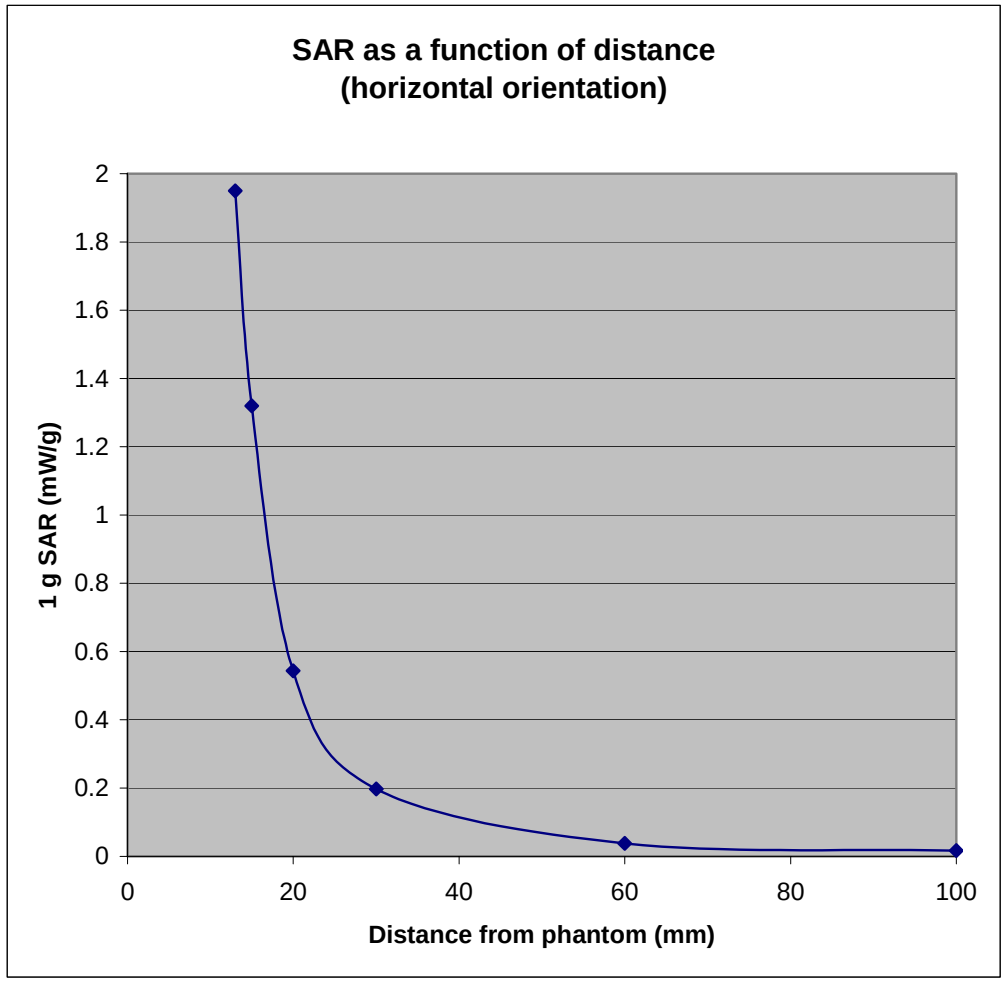
Recent Data From FCC Data Base

Type of Device	Modulation for SAR Testing	Band	Grant Power (W)	Grant Power (dBm)	1g SAR (mW/g)	Specified Separation Distance (cm)
PCMCIA card for UMTS/GPRS/GSM/WLAN	GPRS (UMTS for Europe)	Cellular	1.45	31.6	0.876	1
		PCS	0.794	29.0	1.47	
PCMCIA card for EGPRS/GPRS/GSM	GPRS	Cellular	1.479	31.7	0.772	1
		PCS	0.776	28.9	0.17	
PCMCIA card for UMTS/GPRS/GSM. Internal Anrtenna	GPRS (UMTS for Europe)	Cellular	1.45	31.6	0.876	1
		PCS	0.794	29.0	1.47	
CDMA Dual-Band PCMCIA Card (Permisive change)	CDMA	Cellular	0.339	25.3	1.42	1.23
		PCS	0.262	24.2	0.79	
Laptop computer with GSM, WLAN and BT radios	GPRS	Cellular	0.52	27.2	0.134	Picture indicates approx 8cm
		PCS	0.832	29.2	0.176	
GSM 850/900/1800/1900 and WLAN IEEE802.11g PC card	GSM	Cellular	2.24	33.5	0.306	Approx 2cm
		PCS	0.346	25.4	0.322	
GSM 850/900/1800/1900 and WLAN IEEE802.11g PC card	GSM	Cellular	2.24	33.5	0.545	1.5
		PCS	0.346	25.4	0.663	
GSM 850/1800/1900 PCMCIA Card	GSM	Cellular	0.617	27.9	1.264	1.2
		PCS	0.805	29.1	1.298	
Quadband GSM/GPRS/EDGE PC Card	GSM	Cellular	1.39	31.4	1.19	1.05
		PCS	0.69	28.4	0.167	
Dual-Band CDMA PC Card	CDMA	Cellular	0.266	24.2	0.44	2
		PCS	0.292	24.7	1.26	
Wireless PC Card Modem	GSM/GPRS	PCS	0.832	29.2	0.538	Not declared, picture shows approx 2cm?
3G Wireless PC Card Modem	WCDMA	PCS	0.126	21.0	0.693	Not declared, picture shows approx 2cm?

SAR Versus Distance

Distance (mm)	1 g SAR (mW/g)
13	1.95
15	1.32
20	0.544
30	0.197
60	0.0382
100	0.0163
150	0.00324
200	0.00197

- **QUALCOMM performed SAR measurements using a commercially available laptop configured with a WWAN CDMA PCMCIA card**
- **The aim of the test was to illustrate the relationship between SAR levels and separation distance**



Valid MPE Evaluation at distance less than 20cm

- **FCC Bulletin OET 65 Edition 97-01 section titled "Evaluating Mobile and Portable Devices" describes the definition of "portable" and "mobile" devices and provides links to the derivation of the 20-cm value for differentiating between these two device types**
- **When using the generic equations provided in the OET bulletin to calculate the exposure potential, a WWAN radio operating at the lowest cellular frequency with a maximum power of 500mW complies with the MPE limit at a separation distance of 8.52cm or greater**
- **On reviewing the ANSI/IEEE C95.1-1992 document and the complimentary document ANSI/IEEE C95.3 (1991), which describes the measurement of potentially hazardous fields, it would appear that the 20cm minimum separation distance was derived for a frequency of 300 MHz and that a minimum separation distance of 2 cm is valid for a frequency of 3000 MHz**
  - **Applying the same conditions identified in this document to a frequency of 824 MHz, which corresponds to the minimum frequency of a WWAN cellular device used in the US, results in a minimum separation distance of 7.28 cm as being a separation distance at which a valid MPE measurement can be made.**

Conclusions From QUALCOMM NPRM Filing

- **QUALCOMM asks that the FCC consider the market update, empirical evidence and documented rationale when specifying the power threshold at which SAR data must be supplied for Part 22/24 devices that are integrated into laptops where a 10 cm or greater separation distance can be maintained from the user.**
- **QUALCOMM also proposes that the FCC allow the installation by customers and retailers of Part 22 and 24 approved modules into laptops, just as the FCC today permits unlicensed modules to be installed by end-users into laptops. This would permit laptop vendors to sell WWAN-ready laptop, with the WWAN antennas and other necessary components built in, but in which the end-user could install an approved module (approved for specific laptop models) and enable WWAN connectivity for their laptop device.**

Lenovo Presentation Material

QUALCOMM interim proposal for minimizing SAR tests on embedded WWAN Notebook products

- **QUALCOMM proposes that the FCC adopt an interim procedure for authorizing embedded WWAN notebook products that can be implemented by OET today**
  - **Notebook vendors who have multiple laptops should be allowed to follow the FCC adopted "Three host (multiple) specific absorption rate (SAR) evaluations" which states that:**
    - **If multiple laptop host grant condition is desired, then EMC and SAR testing in three typical host laptops is requested by the Commission."**
- **Example Procedure**
  - **Notebook Vendor provides provisions in multiple notebooks for installation of WWAN approved modules**
  - **Multiple notebooks are designed with an antenna subsystem that meets peak gain conditions listed in the module authorization resulting in WWAN ready product**
  - **Notebook vendor SAR tests a minimum of 3 host WWAN enabled platforms (assuming antenna subsystem is less than currently specified 20cm distance)**
  - **Notebook vendor extends authorization to other Notebook host platforms without the need for further SAR testing**

Lenovo Notebook Assessment Using Proposed Interim Procedure

- Lenovo has performed SAR testing on 3 different notebook products, the W-Note and two versions of the M-Note
- The products were tested using the same WWAN module and antenna subsystems that were optimized for the specific platform
  - While still maintaining peak gain as listed in WWAN module FCC grant
- The standard dev for the SAR values is very low and in all cases the margin of compliance is significant with a minimum of 12dB
- All additional Notebooks using same WWAN module and optimized antenna subsystem should be authorized without the need for additional SAR testing

Summary of SAR Results on Lenovo W-Note and M-Note Host Platforms

Permissive 1 = Permissive change to module grant to add M-note and W-Note
Permissive 2 = Permissive change due to change in antenna structure for both M-note and w-note

M-note Cell SAR Comparison New vs Old Antenna (Mid band channel)

Grant Type	Report Date	FCC ID	Laptop Model	LCD Cover Material	WLAN	Band	Ch	Cond Pwr SAR (dBm)	1g SAR (mW/g)	Margin (dB)	WLAN Status
Permissive 1	6/20/2005	N7N-MC5720	M-note	Metal	Gwinette	Cell	Mid	25.88	0.066	13.85	off
Permissive 1	6/20/2005	N7N-MC5720	M-note	Metal	Gwinette	Cell	Mid	25.88	0.063	14.05	on
Permissive 1	6/20/2005	N7N-MC5720	M-note	Plastic	Gwinette	Cell	Mid	25.88	0.045	15.51	off
Permissive 1	6/20/2005	N7N-MC5720	M-note	Plastic	Gwinette	Cell	Mid	25.88	0.05	15.05	on
Permissive 2	8/30/2005	N7N-MC5720	M-note	Metal	Gwinette	Cell	Mid	25.88	0.064	13.98	off
Permissive 2	8/30/2005	N7N-MC5720	M-note	Metal	Gwinette	Cell	Mid	25.88	0.063	14.05	on
Permissive 2	8/30/2005	N7N-MC5720	M-note	Plastic	Gwinette	Cell	Mid	25.88	0.0794	13.04	off
Permissive 2	8/30/2005	N7N-MC5720	M-note	Plastic	Gwinette	Cell	Mid	25.88	0.082	12.90	on
							Standard Deviation		0.013		

Summary of SAR Results on Lenovo W-Note and M-Note Host Platforms

M-note PCS SAR Comparison New vs Old Antenna (Mid band channel)

Grant Type	Report Date	FCC ID	Laptop Model	LCD Cover Material	WLAN	Band	Ch	Cond Pwr SAR (dBm)	1g SAR (mW/g)	Margin (dB)	WLAN Status
Permissive 2	8/30/2005	N7N-MC5720	M-note	Plastic	Gwinette	PCS	Mid	26.31	0.039	16.13	off
Permissive 2	8/30/2005	N7N-MC5720	M-note	Plastic	Gwinette	PCS	Mid	26.31	0.039	16.13	on
Permissive 2	8/30/2005	N7N-MC5720	M-note	Metal	Gwinette	PCS	Mid	26.31	0.047	15.32	off
Permissive 2	8/30/2005	N7N-MC5720	M-note	Metal	Gwinette	PCS	Mid	26.31	0.048	15.23	on
Permissive 1	6/20/2005	N7N-MC5720	M-note	Plastic	Gwinette	PCS	Mid	26.31	0.042	15.81	on
Permissive 1	6/20/2005	N7N-MC5720	M-note	Plastic	Gwinette	PCS	Mid	26.31	0.046	15.41	off
Permissive 1	6/20/2005	N7N-MC5720	M-note	Metal	Gwinette	PCS	Mid	26.31	0.091	12.45	on
Permissive 1	6/20/2005	N7N-MC5720	M-note	Metal	Gwinette	PCS	Mid	26.31	0.092	12.40	off
							Standard Deviation		0.022		

Summary of SAR Results on Lenovo W-Note and M-Note Host Platforms (cont.)

M-note vs W-note Cell SAR Comparison (Mid band channel)

Grant Type	Report Date	FCC ID	Laptop Model	LCD Cover Material	WLAN	Band	Ch	Cond Pwr SAR (dBm)	1g SAR (mW/g)	Margin (dB)	WLAN Status
Permissive 2	8/30/2005	N7N-MC5720	M-note	Metal	Gwinette	Cell	Mid	25.88	0.063	14.05	on
Permissive 2	8/30/2005	N7N-MC5720	M-note	Metal	Gwinette	Cell	Mid	25.88	0.064	13.98	off
Permissive 2	8/30/2005	N7N-MC5720	M-note	Plastic	Gwinette	Cell	Mid	25.88	0.0794	13.04	off
Permissive 2	8/30/2005	N7N-MC5720	M-note	Plastic	Gwinette	Cell	Mid	25.88	0.082	12.90	on
Permissive 1	6/20/2005	N7N-MC5720	M-note	Plastic	Gwinette	Cell	Mid	25.88	0.045	15.51	off
Permissive 1	6/20/2005	N7N-MC5720	M-note	Plastic	Gwinette	Cell	Mid	25.88	0.05	15.05	on
Permissive 1	6/20/2005	N7N-MC5720	M-note	Metal	Gwinette	Cell	Mid	25.88	0.063	14.05	on
Permissive 1	6/20/2005	N7N-MC5720	M-note	Metal	Gwinette	Cell	Mid	25.88	0.066	13.85	off
Permissive 1	6/20/2005	N7N-MC5720	W-note	Plastic	Bartlette	Cell	Mid	25.88	0.035	16.60	off
Permissive 1	6/20/2005	N7N-MC5720	W-note	Plastic	Bartlette	Cell	Mid	25.88	0.04	16.02	on
Permissive 1	6/20/2005	N7N-MC5720	W-note	Plastic	Calexico 2	Cell	Mid	25.88	0.057	14.48	off
								Standard Deviation	0.015		

Summary of SAR Results on Lenovo W-Note and M-Note Host Platforms (cont.)

M-note vs W-note PCS SAR Comparison (Mid band channel)

Grant Type	Report Date	FCC ID	Laptop Model	LCD Cover Material	WLAN	Band	Ch	Cond Pwr SAR (dBm)	1g SAR (mW/g)	Margin (dB)	WLAN Status
Permissive 2	8/30/2005	N7N-MC5720	M-note	Plastic	Gwinette	PCS	Mid	26.31	0.039	16.13	off
Permissive 2	8/30/2005	N7N-MC5720	M-note	Plastic	Gwinette	PCS	Mid	26.31	0.039	16.13	on
Permissive 2	8/30/2005	N7N-MC5720	M-note	Metal	Gwinette	PCS	Mid	26.31	0.047	15.32	off
Permissive 2	8/30/2005	N7N-MC5720	M-note	Metal	Gwinette	PCS	Mid	26.31	0.048	15.23	on
Permissive 1	6/20/2005	N7N-MC5720	W-note	Plastic	Bartlette	PCS	Mid	26.31	0.059	14.33	on
Permissive 1	6/20/2005	N7N-MC5720	W-note	Plastic	Bartlette	PCS	Mid	26.31	0.06	14.26	off
Permissive 1	6/20/2005	N7N-MC5720	M-note	Plastic	Gwinette	PCS	Mid	26.31	0.042	15.81	on
Permissive 1	6/20/2005	N7N-MC5720	W-note	Plastic	Calexico 2	PCS	Mid	26.31	0.063	14.05	off
Permissive 1	6/20/2005	N7N-MC5720	M-note	Plastic	Gwinette	PCS	Mid	26.31	0.046	15.41	off
Permissive 1	6/20/2005	N7N-MC5720	M-note	Metal	Gwinette	PCS	Mid	26.31	0.091	12.45	on
Permissive 1	6/20/2005	N7N-MC5720	M-note	Metal	Gwinette	PCS	Mid	26.31	0.092	12.40	off
								Standard Deviation	0.019		

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Thank You